"Doc, You Said My Buttock Pain Comes From My SI; Is It Because I Read That Sports Magazine so Much?"

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OBJECTIVES

At the conclusion of the PBLD, the attendees will be able to:

1. Describe the "red flags" for potentially serious conditions in patients with acute low back problems
2. Know the indications for fluoroscopy, the volume and the drug injected in epidural steroid injections
3. Discuss the advantages and disadvantages of translaminar and transforaminal epidural steroid injections
4. Understand the signs and symptoms and treatments of nerve root irritation (herniated disc), piriformis syndrome, and sacroiliac joint syndrome

STEM CASE - KEY QUESTIONS

A 42-year old male had a sudden onset of back pain after lifting a luggage in the airport. His back pain radiated to the lateral aspect of his right leg. An MRI showed a posterolateral herniated disc at L5-S1 impinging on the right S1 nerve root. He did not respond to bed rest, COX-2 inhibitor, and muscle relaxants. The pain continued for a month and was referred to the Pain Medicine Center for "epidural steroid injections (ESIs)".

What are the "red flags" for tumor, infection, or possible cauda equina syndrome?

What is the rationale for epidural steroid injections?

What are the indications for fluoroscopy? Do you inject a dye routinely?

What steroid and diluent do you use, and how much volume do you inject?

The patient had 50% relief after two interlaminar epidural steroid injections and a transforaminal epidural steroid injection was planned.

Do you agree with the plan to perform transforaminal an epidural steroid injection?

What are the theoretical advantages of transforaminal over translaminar epidural steroid injections?

How do you perform transforaminal injections?

If the procedure is performed at the cervical region, what steroid do you use?

The patient's residual pain was relieved by the transforaminal epidural steroid injection. He called 6 months later because his pain recurred after a long airplane ride. The character of his pain is different from the one he had previously. Whereas his previous pain started in his low back and radiated to his right leg, his present pain starts in his right buttock and radiates to his

groin and lateral thigh. There is no radiation to his ipsilateral (right) leg. Physical examination revealed pain on pressure along his sacroiliac joint. Flexion and extension movements of his back were normal. Sensory and motor examinations were also normal. Deep tendon reflexes were normal and his straight leg raising was 90° bilaterally. The following tests, supportive of a sacroilic joint syndrome, were positive: Patrick's, Gaenslen's, Yeoman's, and posterior shear (POSH) test. The tests for piriformis syndrome (Pace, Laseque, and Freiberg signs) were negative. He responded to injection of his sacroiliac joint under fluoroscopy.

Would you repeat the MRI?

What causes sacroiliac joint syndrome?

What are the signs and symptoms of sacroiliac joint syndrome? What are Patricks, Gaenslen's, Yeoman's, and posterior shear tests?

How do you differentiate sacroiliac joint syndrome from piriformis syndrome, another cause of buttock pain? What are Pace, Laseque, and Freiberg signs?

What are the treatments of sacroiliac joint syndrome?

How do you inject the SI joint under fluoroscopy?

What other options do you have if the SI joint injection does not work?

PROBLEM BASED LEARNING DISCUSSION

Red Flags

Potentially serious conditions, including tumor or infection, fracture, and cauda equina syndrome, should be eliminated in patients with acute low back pain. The "red flags" for tumor or infection are the following (1):

- age over 50 and under 20
- history of cancer
- constitutional symptoms such as recent fever or chills or unexpected weight loss
- risk factors for spinal infection: recent bacterial infection (e.g. urinary tract infection); IV drug abuse; or immune suppression (from steroids, transplant, or HIV)

The "red flags" for possible fracture are:

- major trauma, such as vehicle accident or fall from height
- minor trauma or even strenuous lifting (in older or potentially osteoporotic patient)

The "red flags" for possible cauda equina syndrome are:

- saddle anesthesia
- recent onset of bladder dysfunction, such as urinary retention, increased frequency, or overflow incontinence
- severe or progressive neurologic deficit in the lower extremity

The indication for lumbar or cervical epidural steroid injection (ESI) is nerve root irritation and inflammation (2). The presence of nerve root edema has been noted surgically and shown on CT scanning in patients with herniated disc. Samples from herniated discs contain high levels of phospholipase A_2 and steroids are phospholipase A_2 inhibitors. Also, steroids block nociceptive input. Corticosteroids suppress ongoing discharge in chronic neuromas and prevent the development of ongoing discharges from experimental neuromas (3). The local application of methylprednisolone acetate was found to block transmission in C fibers but not in A-beta fibers (4).

The use of fluoroscopy has become common in epidural steroid injections (5). Incorrect needle placement occurs in 20-38% of caudal and 30% of translaminar epidural steroid injections (6-8). In post-laminectomy patients, it was noted that the needle was placed 1 or 2 spaces above or below the predetermined level in 53% of the patients and that the contrast reached the level of pathology in only 26% of cases (9). In cervical epidural steroid injections, the contrast spreads unilaterally in 51% of the injections (10). The drawbacks for not using fluoroscopy include the potential for false loss of resistance, failure to reach the targeted destination, inaccurate entry level, inability to assess ideal site of entry (e.g., post-fusion, patients with SCS lead), and failure to document possible cause of lack of efficacy (e.g. unilateral contrast spread). It appears that fluoroscopy is recommended in the following:

- post-laminectomy patients
- obese patients
- cervical epidural steroid injections
-patients who did not respond to the first epidural steroid injection

Either methylprednisolone acetate or triamcinolone diacetate is used. There has been no study that compared the effectiveness of these agents. The volume varies, a 5 to 10 mL volume has been recommended at the lumbar level to bathe the nerve roots in the area and to dilute the polyethylene glycol vehicle (11). It appears that either saline or local anesthetic is acceptable as the diluent and there appears to be no advantage of one diluent over the other. For the cervical region, a 3-6 mL volume is recommended.

Recently the transforaminal approach to epidural steroid injections has been employed. This is especially beneficial in post-laminectomy patients (12) where the drug may not reach the level of pathology (9) because the spread of the injectate is limited by scarring from the previous surgery. The rationale for the transforaminal approach is the ability of the drug to reach the anterior epidural space, where the pathology (herniated disc) is located. The disadvantage is that the injection is one-sided and the spread of the drug is probably more limited. In a study of 69 patients, it was found that 74% of the patients had relief of $\geq$ 50% after an average of 1.8 transforaminal steroid injections (13). Transforaminal epidural steroid injections were found to be more effective than trigger point injections in patients with lumbosacral radiculopathy, its success rate was 84% compared to 48% after TPIs (14). Transforaminal injection of 1 mL 0.25% bupivacaine with 6 mg betamethasone appears to be more effective than transforaminal bupivacaine (15). For cervical transforaminal epidural steroid injections, saline is probably preferable to local anesthetic. The use of methylprednisolone in cervical transforaminal

injections is not recommended because it precipitates and the precipitant may be unintentionally injected into the vertebral artery and embolizing it into an end-cerebral artery.

Buttock Pain: Piriformis Syndrome Versus Sacroiliac Joint Syndrome

Pain originating from the buttock can originate from the sacroiliac joint (SIJ) or from the piriformis muscle. The pain physician has to be able to differentiate these two syndromes and know the characteristic signs of both syndromes. In the case presented, the patient had symptoms supportive of an SI joint syndrome. The patient's pain started in his buttock and radiated to his groin and lateral thigh which is characteristic of an SI joint syndrome. He had no radicular pain, radicular pain is seen in piriformis syndrome when the sciatic nerve is irritated by the piriformis muscle. The signs of sacroiliac joint syndrome were present in the patient whereas the signs of piriformis syndrome were absent.

Piriformis syndrome is caused by trauma to the buttock, anatomic abnormalities of the piriformis muscle or the sciatic nerve, differences in leg lengths, or piriformis myositis (16). The patient with piriformis syndrome complains of buttock pain that usually extends from the sacrum to the ipsilateral hip. The buttock pain may radiate to the ipsilateral leg if the piriformis muscle irritates the sciatic nerve. The pain is usually aggravated by prolonged sitting, as in driving or biking, or when getting up from a sitting position. It is worse after sitting on hard surfaces with a wallet on the patient's back pocket ("wallet sciatica").

Characteristics of Piriformis Syndrome
The pain is aggravated by hip flexion, adduction, and internal rotation.
Pace sign: pain and weakness on resisted abduction of the hip while the patient is seated, i.e. the hip is flexed.
Laseque sign: pain on voluntary flexion, adduction, and internal rotation of the hip.
Freiberg sign: pain on forced internal rotation of the extended thigh.
The Laseque and Freiberg signs are better understood when one realizes that the function of the piriformis muscle is to internally rotate the flexed hip and externally rotate the extended hip.

Neurological signs are usually negative in piriformis syndrome. EMG may show a delay in the H-reflex with the affected leg in a flexed, adducted, and internally rotated (FAIR) position (17). Computed tomography (CT) of the soft tissues of the pelvis may show an abnormal uptake by the piriformis muscle or an enlarged muscle while the magnetic resonance imaging confirms the enlarged piriformis muscle.

The treatments of piriformis syndrome include physical therapy and the use of anti-inflammatory drugs, analgesics, and muscle relaxants to reduce inflammation, pain, and spasm. Physical therapy involves stretching of the piriformis muscle with flexion, adduction, and internal rotation of the hip followed by pressure applied to the muscle. Patients who do not respond to conservative therapy are offered local anesthetic and/or steroid injections. The older techniques of injection were done blindly while newer techniques involved the use of muscle electromyography (18) or CT (19) to identify the piriformis muscle, and the use of a nerve stimulator to identify the sciatic nerve (20).

Another technique is the fluoroscopy- and nerve stimulator-guided injection of the piriformis muscle and around the sciatic nerve (21). The needle is inserted lateral and caudal to the SI joint and the needle is inserted to a depth of 8-13 cm until the sciatic nerve is stimulated. The needle is pulled back 0.3-0.5 cm and steroid/local anesthetic is injected perisciatically. This is to inject the steroid in the area of the sciatic nerve for its antiinflammatory and nociceptive blocking effects. The needle is pulled back another 0.5-0.8 cm and dye is injected to outline the piriformis muscle. The steroid and local anesthetic is then injected into the belly of the muscle. Our initial follow-up showed good relief of the patient's pain for 2 weeks to 3 months.

The piriformis steroid/local anesthetic injection may be repeated. If the relief is transient then piriformis muscle may be injected with botolinum toxin. Doses of botulinum toxin are 100 mouse units of botulinum toxin type A (Botox) in 4 ml bupivacaine or 5,000 to 10,000 units of botulinum type B.

Sacroiliac Joint syndrome

Sacroiliac joint dysfunction is pain from a sacroiliac joint that has no demonstrable lesion and is presumed to have some type of biochemical abnormality that causes the pain (22). It is diagnosed by detecting abnormalities on physical examination. The pain from sacroiliac joint dysfunction is located in the superior medial quadrant of the buttock, inferior to the posterior superior iliac spine, the lateral buttock with radiation to the greater trochanter and upper lateral thigh, and in the groin. There may be radiation below the knee (23-25).

Tests for Sacroiliac Joint Dysfunction
Faber Patrick test (left SI joint dysfunction)**:**
Patient is supine
Left leg, near the ankle, is placed in front of the right thigh above the knee. Physician places one hand over the right iliac crest while the other hand pushes over the medialaspect of the left knee
Stresses SI and hip joint
Positive test: pain over SI joint region (also back, buttock, groin)

Gaenslen's test (left SI joint dysfunction)**:**
Patients is supine
Examiner flexes right hip and right knee (hip joint is maximally flexed on side)
Examiner presses downward over the left thigh (the other hip joint is hyperextended)
Positive test: Pain the left SI joint
Stresses both SI joints
Also stresses the hip joint and stretches the femoral nerve

Yeoman's test (Extension test):
Patient is prone
Examiner places one hand above the anterior knee and lifts thigh (extends hip), the other hand presses downward over the crest of the ilium
The hip is extended and the ipsilateral ilium is rotated
Positive test: pain over the posterior SI joint
Stresses the SI joint (also extends the lumbar spine and stresses the femoral nerve)

Sacroiliac shear test (Posterior shear test, POSH test):
Patient is prone
Palm of examiner's hand is placed over the posterior iliac win. Shear trust is directed inferiorly (produces a shearing force across the SI joint)
Positive test: pain in symptomatic SI joint

Gillet's test:
Patient is standing
One of examiner's thumbs is placed on the second sacral spinous process, the other thumb is placed on the posterior superior iliac spine (PSIS)
Normal SI joint: When the patient maximally flexes his hip, the posterior superior iliac spine (PSIS) moves inferior to the S2 spinous process
Dysfunctional or fixed SI joint: PSIS remains at the level of the S2 spinous process or moves superior to the sacrum

The diagnosis of SI joint dysfunction can be presumed based on the history, symptoms and positive screening tests (some experts require three positive screening tests to confirm SI joint dysfunction). Radiographic evaluation of the joint rarely adds value. While provocation of pain on injection of the SI joint is not a suitable criterion of SI joint dysfunction, a diagnostic local anesthetic block of the joint is considered to be the standard criterion for SI joint pain.

Technique of sacroiliac joint injection (26)
Fluoroscopy guidance is recommended during injection of the sacroiliac joint. The patient is prone, the fluoroscopy is perpendicular to the table, and the inferior aspect of the joint is marked. The tube is angled 20° to 25° caudad,[26] this maneuver projects the posteroinferior portion of the joint. The needle is advanced through the capsule and ligaments of the joints, one mL contrast is injected and the joint is outlined. Then one mL of lidocaine or bupivacaine with steroid (40-60 mg methylprednisolone or 6 mg betamethasone) is injected. Some investigators consider a greater than 75 percent reduction of pain as a "definite response".

The treatments of SI joint syndrome include exercise, joint mobilization, joint manipulation, or joint injections to restore the balance between joint motion and normal function of the overlying muscle. A two-week regimen of anti-inflammatory medication is recommended. A range-of-motion exercise program promotes trunk and hip flexibility and stretch of the hamstring muscles. Side posture manipulation of the posterior superior iliac spine and the inferior sacroiliac joint mobilize a stiff sacroiliac joint. Joint mobilization followed by an exercise program may prevent recurrence of sacroiliac joint syndrome.

Radiofrequency (RF) denervation of the sacroiliac joint has been reported to be effective in reducing the pain from sacroiliac joint syndrome. In a retrospective study, Ferrante et al reviewed their results in 33 consecutive patients with sacroiliac joint syndrome who had the treatment (27).

A retrospective study showed the efficacy of lateral branch blocks in the treatment of sacroiliac joint pain (28). Eighteen patients with SI joint pain had nerve blocks of the L4-L5 primary dorsal rami and the S1-S3 lateral branches. Thirteen of the 18 patients obtained ≥ 50% relief, 2 of the 13 patients had relief that lasted several months. Nine of the 13 patients underwent RF lesioning

of the nerves. Eight of the 9 patients who had the RF denervation experienced > 50 percent relief that persisted for at least 9 months (28). The efficacy of this treatment was later questioned in view of the wide innervation of the SI joint and the nerve blocks/RF only lesions the nerve innervation of the posterior SI joint (29).

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Recommended reading list:

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